CHAPTER 2: ALTERNATIVES

This chapter is organized in two main parts. The first part ("Highway Reconstruction") presents the alternatives for the proposed upgrading of U.S. Highway 189 (US-189) in Provo Canyon, as part of the Provo Canyon Highway Improvement Project (Project). The second part ("Trail Extension") presents the alternatives for the proposed extension of the Provo/Jordan River Parkway Trail through Provo Canyon.

HIGHWAY RECONSTRUCTION

U.S. Highway 189, a principal arterial and an official Utah Scenic Byway, performs several important functions: It serves as the primary access for recreation activities in Provo Canyon and as a commuter route for residents between the Provo/Orem metropolitan area and the Heber Valley. The various safety and capacity problems associated with the highway had risen to a level of concern by the early 1970s, and the State of Utah Department of Transportation (UDOT) began efforts to develop the Project at that time.

Since the 1970s, a wide variety of alternatives have been considered to address the purpose and need of the Project. The alternatives developed in the previous studies have been considered and utilized in each subsequent analysis as designs became more refined in preparation for construction. This Supplemental Environmental Impact Statement (SEIS) focuses on changes to the Project since the 1989 SEIS and, in particular, focuses on the proposal to construct the next segment from Wildwood to Deer Creek State Park (see Figure 1-3).

To facilitate the reader's understanding of how this SEIS relates to previous studies for the Project, this section of the Alternatives chapter summarizes the alternatives analyses that were included in the previous documents. This section is organized as follows:

- Alternatives Analyses in 1978 Environmental Impact Statement (EIS)
- Alternatives Analyses in 1989 SEIS
- Re-Evaluations and Technical Studies in 1990s
- Alternatives Analyses in Current SEIS
- Description of 2002 Preferred Alignment from Wildwood to Deer Creek State Park

Alternatives Analyses in the 1978 Environmental Impact Statement (EIS)

The initial efforts of UDOT on the Project resulted in the Utah Valley to Heber Valley EIS, which was prepared between 1971 and 1978 (FHWA 1978). During this effort, a wide variety of alternatives were developed and considered. These included the following:

- Maintenance of Status Quo - No Build
- Alternative Routings within Corridor - North Wall, South Wall, Spanning Wallsburg Bay
- Partial Alternative Corridor - 1400 North in Orem, 1600 North in Orem, American Fork Canyon, Northwest Shore of Deer Creek Reservoir, across Deer Creek Reservoir
- Full Alternative Corridor - Hobble Creek Canyon, Diamond Fork Canyon
- Alternative Mode - Shuttle bus system, gondola or tramway, toll road

All of these alternatives were eliminated for various combinations of practicality, cost, environmental effects, and inadequacy and are explained in detail in the document (FHWA 1978).

Since all of the above were full or partial alternatives to improvement of the existing highway corridor and all were eliminated, the proposed action was based upon modifications to the existing highway. The improvement alternative developed during that analysis – adopted by the Utah Transportation Commission on November 4, 1977, and approved by the Federal Highway Administration (FHWA) – included the following: widening of State Route 52 (800 North in Orem) to four lanes from U.S. Highway 89 (US-89) in Orem (Center Street) to its intersection with US-189 at Olmstead Junction (Olmstead), construction of an improved two-lane roadway with passing lanes from Olmstead to Vivian Park, construction of an improved two-lane highway on existing alignment between Vivian Park and Wildwood, and "timely improvements of a non-major character" from Wildwood to Heber City (FHWA 1978).

Alternatives Analyses in the 1989 Supplemental Environmental Impact Statement (SEIS)

On March 20, 1987, the FHWA published a Notice of Intent in the Federal Register to prepare a SEIS for the Project. This decision was based on the presence of changed conditions, such as accelerated traffic growth and revised environmental requirements, certain deficiencies in the 1978 EIS, and design revisions not covered in that document. The new SEIS maintained the same termini as the 1978 EIS (I-15 to US-40) but emphasized improvements to US-189 from its junction with State Route 52 at Olmstead on the west to the intersection of US-189 and US-40 in Heber City on the east. The FHWA and UDOT issued a Draft SEIS for the Project in June 1988 and a Final SEIS in November 1989. (FHWA 1989a). The FHWA approved a Record of Decision for the Project on March 21, 1990.

The 1989 SEIS developed several alternatives based upon two distinct service functions: mobility and accessibility. The 1989 SEIS explained the relationship between mobility and accessibility as follows:

> The two functions inherently conflict with each other. The mobility function services long-distance commercial, regional recreation, and local commuter travelers who want to move through the area with no interruptions, while the accessibility function serves the local residential and day-use recreation travelers who enter and leave the roadway at numerous locations along the route. Mobility necessitates the regulated limitation of access; conversely, provisions for access limit mobility. Therefore, no improvement alternative can completely satisfy both highway functions simultaneously (1989 SEIS, page 2-2).

Alternatives Considered in Detail in the 1989 Supplemental Environmental Impact Statement (SEIS)

In an effort to address the need for both mobility and accessibility on US-189 and to provide a consistent design with safe operating conditions, three build alternatives were examined in the 1989 SEIS for the improvement of the highway:

- The Accessibility Alternative would emphasize access to recreation and residential areas, while minimizing environmental impacts. This alternative would provide a two-lane roadway with no access control. Pedestrian and bicycle usage would be allowed.

- The Mobility Alternative would emphasize through-traffic movements for commuters and long-distance travelers. This alternative would provide a four-lane roadway with full access control (i.e., no at-grade access would be allowed). This alternative would not allow for usage of the facility by pedestrians or bicycles.

- The Multi-Use Alternative would provide for a balance between mobility and accessibility. Like the Mobility Alternative, this alternative would provide a four-lane roadway. However, unlike the Mobility Alternative, this alternative would include a limited number of at-grade access points, in order to allow for access to recreational and other sites along the roadway. These alternatives are described in the 1989 SEIS at pages 2-15 through 2-22.

Alternatives Eliminated without Detailed Study in the 1989 Supplemental Environmental Impact Statement (SEIS)

In addition to the Accessibility, Mobility, and Multi-Use Alternatives, there were several other alternatives that were considered but not advanced in the 1989 SEIS:

- The 1978 Final EIS Alignment involved the construction of an improved two-lane roadway from Olmstead to Wildwood, with passing lanes for a portion of that distance (from Olmstead to Vivian Park.) For the remainder of the corridor, from Wildwood to Heber City, this alternative involved only “timely improvements of a non-major character to enhance

safety and remove critical points of congestion." This alternative was eliminated from consideration in the 1989 SEIS because it would not provide an acceptable level of service, and thus did not satisfy the purpose and need for the Project.

- The Upgrade Existing Alignment - Lower Canyon alternative involved a three-lane cross-section, with two lanes up-canyon (toward Heber City) and one lane down-canyon (toward Orem). This alternative eliminated from consideration in the 1989 SEIS because it would not provide an acceptable level of service, and thus did not satisfy the purpose and need for the Project.

- The Hoover Slide Alignments involved a shift in the location of the roadway away from the Provo Rover, in order to avoid the most active slides near the river. All of these alignments would have involved some impact on the Canyon Meadows development. These alternatives were eliminated from consideration in the 1989 SEIS because they would require the same drainage provisions as the preferred alternative and thus would provide no savings over that alternative.

- The East Canyon/Wallsburg Bridge involved a crossing of the Provo River just north of Wildwood. Under this alternative, the highway would remain on the west side of the river up to Wildwood, and then would cross over to the east side, in order to avoid the Hoover Slide. The roadway would then be constructed on new location along the east side of the river from Wildwood to Deer Creek State Park, at which point it would re-connect with the existing alignment of US-189 and would continue on to Heber City. This alternative was eliminated from consideration in the 1989 SEIS for several reasons, including significant impacts to terrestrial habitat on the east side of the river and both visual and noise impacts to the Deer Creek Campground.

- The Wallsburg Bay Bypass involved a relocation of the existing roadway around Wallsburg Bay, in order to eliminate a curve in the roadway. This alternative was eliminated from consideration in the 1989 SEIS because earthwork required for the roadway would have eliminated much of the existing parking and camping areas within the Deer Creek State Park, and would have involved excavations over 200 feet deep on the north side of Wallsburg Bay.

- The Wallsburg/Charleston Reroute also would have involved the elimination of the existing curve at Wallsburg Bay. This alternative was eliminated from consideration in the 1989 SEIS because it would divert traffic away from the existing reservoir recreation areas and because it would involve 2-mile-long sections of roadway with steep 5 percent grades.

- The West Reservoir/North End Alternatives involved a shift in the alignment of the roadway between Deer Creek State Park and Heber City. Rather than crossing over the Provo River, and running along the east side of Deer Creek Reservoir, this alternative would remain on the west side of the reservoir, following the path of an existing railroad, and then would cross over the railroad and continue toward the east, connecting to the existing US-189

roadway near the Heber City Airport. This alternative was eliminated from consideration in the 1989 SEIS for several reasons, including its potential adverse impacts on the Midway and Charleston communities and its impacts on marsh habitat north of the Deer Creek Reservoir. These alternatives are described in the 1989 SEIS at pages 2-23 through 2-33.

Preferred Alternative in the 1989 Supplemental Environmental Impact Statement (SEIS)

Following public and agency review and comment, a Final SEIS was released in November 1989. The preferred alternative, as defined in that document, was based on the "Multi-Use Alternative" in the 1988 Draft SEIS. This preferred alternative, which involved the upgrade of the existing highway to four lanes through the canyon, was designed to address the dual character of the highway (mobility and accessibility) and provide a consistent design with safe operating conditions and an acceptable Level of Service.

The Accessibility Alternative was not selected because it provided a low Level of Service and thus did not meet the purpose and need of the project. The Mobility Alternative was not selected because it resulted in extensive environmental impacts, was very expensive, and provided only marginal increases in Level of Service compared to the Multi-Use Alternative. The No-Build Alternative was not selected because the existing roadway would not provide a safe facility or accommodate an adequate Level of Service for traffic flow, and public opposition was high due to its inability to address existing safety deficiencies.

Re-Evaluations and Technical Studies in the 1990s

For purposes of final design and construction, the preferred alternative identified in the 1989 SEIS was divided into four segments:

- Murdock Diversion to Upper Falls Segment - 5.5 kilometers (3.4 miles)
- Upper Falls to Wildwood Segment - 4.0 kilometers (2.5 miles)
- Wildwood to Deer Creek State Park Segment - 8.5 kilometers (5.3 miles)
- Deer Creek State Park to Heber City Segment - 15.3 kilometers (9.5 miles)

Following the approval of the 1989 SEIS, UDOT proceeded with design and construction of these segments, starting with the segment from Murdock Diversion to Upper Falls. As part of that effort, it was necessary to prepare Re-Evaluations at various times for three of the four segments. These Re-Evaluations involved consideration of potential alignment shifts and design modifications, as described below.

Re-Evaluation for Murdock Diversion to Upper Falls Segment

The Murdock Diversion to Upper Falls Segment was completed in 1994, in accordance with the design proposed in the 1989 SEIS. Although that SEIS indicated that concrete median barrier would not be used in the canyon, subsequent accident data and public concern suggest it be utilized at certain locations. The FHWA has prepared an Environmental Re-evaluation (FHWA 2001) to address this change and authorize the installation of median barrier along the section at certain locations.

Re-Evaluations for Upper Falls to Wildwood Segment

During final design of the Upper Falls to Wildwood Segment, it was determined that some modifications were required. Accordingly, in 1993, the FHWA and UDOT prepared a Re-Evaluation for this segment. The 1993 Re-Evaluation involved the consideration of four additional alternatives, which were developed and evaluated with concurrent public involvement and agency coordination. Based on the 1993 Re-Evaluation, the FHWA and UDOT selected a new design for the Upper Falls to Wildwood Segment. The new design, which is known as the "Modified Twin Tunnel Alternative," varied from the 1989 SEIS Alignment in several aspects:

- The tunnel north of River Bend was eliminated because of unfavorable geologic conditions and a roadway cut proposed instead,

- The roadway cut near Wildwood was eliminated and twin tunnels were designed to carry traffic in eastbound and westbound directions, and

- The roadway between River Bend and Wildwood was shifted further into the hillside to provide additional clearance between the roadway and the Provo River.

Construction on the Upper Falls to Wildwood Segment was initiated in 1996 and largely completed in 2000, in accordance with the modified alternative described in the 1993 Re-Evaluation. As a part of this effort, a construction road known as the "haul road" was constructed on the alignment of the next (Wildwood to Deer Creek State Park) segment to move excess fill material to a future fill slope without impacting existing traffic. (See below for additional information on the haul road.)

Final cut slope treatment in some portions of the Upper Falls to Wildwood Segment was not completed under the original construction contract in 2000. In 2001, the FHWA and UDOT prepared a second Re-Evaluation for this segment. The 2001 Re-Evaluation addressed cut slope treatment and the need for concrete median barrier for safety purposes at certain hazardous driving locations within the canyon. Because of considerable agency and public concern as to the final appearance of the treatments, a committee of agency and special interest groups was formed to recommend possible aesthetic treatments to minimize visual impacts. Input from this committee was incorporated into the final cut slope treatment design. Several public meetings were held (April 27, 2000, and August 29, 2001) to provide information and accept comments regarding the planning and design of the slope treatments.

The final cut slope treatments for the Upper Falls to Wildwood Segment were completed in 2002, in accordance with the modifications approved in the 2001 Re-Evaluation. Methods and appearance of cut slope treatments in this segment will also be utilized to the extent possible in subsequent segments in order to maintain appropriate consistency throughout the canyon.

Re-Evaluation/Technical Studies for Wildwood to Deer Creek State Park Segment

In 1993, UDOT initiated preliminary design for the Wildwood to Deer Creek State Park Segment. During the preliminary design process, a number of problems surfaced that required an investigation of alternative alignments or alignment modifications. These problems included the following:

- Impacts to the Provo River and the Heber Valley Historic Railroad (HVHR) considerably beyond those indicated in the SEIS,
- Probable inability to stabilize the Hoover Slide as anticipated in the 1989 SEIS, and
- Substandard roadway geometrics inherent in the conceptual 1989 SEIS Alignment.

As a result of the anticipated large construction costs and number of alignment variations proposed, a Value Engineering (VE) process was conducted in 1994. The information developed in the 1994 VE study was then incorporated into a Re-Evaluation, which was prepared in 1995. The 1995 Re-Evaluation resulted in the adoption of a new preferred alignment, which differed in several ways from the preferred alignment identified in the 1989 SEIS.

Following the 1995 Re-Evaluation, funding availability precluded UDOT from continuing as planned, and final design and construction was delayed several years. Efforts to advance this segment were re-initiated in 2000. At that time, several additional studies were completed, including a second VE study, a geotechnical study, an avalanche study, and a traffic study. All of those additional studies have been incorporated into this SEIS.

The studies completed for the Wildwood to Deer Creek State Park Segment since 1989 – including the 1994 VE Study, the 1995 Re-Evaluation, and the later technical studies – are described below.

1994 Value Engineering (VE) Study

Value Engineering is an analytical decision-making process to achieve the best value from a proposed roadway project within a limited construction budget. It entails the systematic application of recognized techniques by a multi-discipline team that identifies the function of a product or service, establishes a worth for that function, generates alternatives through the use of creative thinking, and reliably provides the needed functions at the lowest overall cost.

The objective of the process is to achieve the required function of the Project at the lowest possible cost consistent with requirements for performance, maintainability, safety, environment, and aesthetics. The VE process is applicable if a project cost is anticipated to exceed $2 million and entails either new construction, reconstruction, rehabilitation, or is unique or controversial. The

Wildwood to Deer Creek State Park Segment was appropriate for the VE process since it was estimated to cost $50 million, involved reconstruction of an existing highway, and was controversial. The VE team for the Wildwood to Deer Creek State Park Segment included experts in structural engineering, geotechnical engineering, roadway design, construction, environmental, hydraulic, and safety issues.

The VE process includes a number of phases. Those utilized for this effort included the following:

- Investigation: Identify and define the function(s) of each element. Determine functional cost, keeping in mind that value is maximum when performance is reliably achieved for minimum total cost. Thus, satisfactory performance throughout the desired life cycle of the product is essential to good value.

- Speculation: Identify all possible functions of the high-cost design elements (identified in the Investigation) and develop a number of alternatives for each.

- Evaluation: Analyze the results of the Speculation and, through review of the various alternatives, select the best ideas for further expansion.

- Development: Collect additional data to thoroughly analyze those alternatives selected during the Evaluation, prepare cost estimates, and change proposals that will assure feasibility if implemented.

- Presentation: Prepare a report (VE recommendations) presenting the recommended alternatives.

Investigation Phase

During the Investigation Phase, a wide range of engineering and environmental information was gathered to identify the opportunities and constraints associated with locating the roadway through the Wildwood to Deer Creek State Park Segment. Environmentally, this information described the effects of the Project on wetlands, noise levels, wildlife, fisheries, visual resources, cultural resources, vegetation, socio-economics, geotechnical considerations, and land use in the Project Area. The resource information was compiled and mapped as necessary, and provided to the VE team.

Speculation Phase

The Speculation Phase included the development of a number of alternatives to the SEIS Alignment within each of the four Project Area design sections. In total, 56 different alignment variations to the SEIS Alignment were developed and forwarded for the VE process: 13 in Section 1, 29 in Section 2, and 14 in Section 3, with the SEIS Alignment determined to be appropriate for Section 4. A Value Engineering for Highways Study Workbook (Workbook) was developed to document the entire VE process and is provided in Appendix D.

Evaluation Phase

During the Evaluation Phase, all these alignment variations were evaluated using the SEIS Alignment as a comparative baseline. Each variation was compared with the SEIS baseline and the advantages or disadvantages were defined. Those variations that were not feasible for safety, mobility, constructability, cost, environmental, geotechnical, or engineering design reasons, and those variations that were outside the scope of the SEIS were not forwarded for further study. This phase was also documented in the Workbook and resulted in forwarding a total of 15 variations to the Development Phase: 4 in Section 1, 7 in Section 2 (after another iteration of the Speculation Phase), 3 in Section 3, and 1 (the SEIS) in Section 4. Typical sections and plans for each of the variation options considered feasible and forwarded to the Development Phase are provided in Appendix D.

Development Phase

During the Development Phase, cost estimates and additional details were generated, and the VE team then evaluated each of the alignment variations within the four sections of the Wildwood to Deer Creek State Park Segment in terms of selection criteria in seven categories: cost, geometrics/safety, geotechnical/maintenance, environmental, construction, traffic control, and public comment. Considerations in the environmental category during this effort included impacts to wetlands, vegetation and wildlife, fisheries, visual resources, socio-economics, land use, noise, and cultural resources, all of which were quantified and compared (see details in Workbook). The impact analyses in Chapter 4 demonstrates the type and detail of environmental information considered for each variation.

The weighting and scoring of the final alignment variations in the seven categories in each section is documented in detail in the Workbook. The alignment variation with the overall highest score in each section was selected as the component of the Preferred Alignment through that section. Although every variation had some advantages in certain areas, those eliminated had been given low scores in two or more of the seven evaluation categories which countered those advantages. The recommendations of the effort were presented to and approved by the design team and UDOT Management during the Presentation Phase.

1995 Re-Evaluation

Preparation of the 1995 Re-evaluation was initiated late in 1993. As detailed in Chapter 6, agency coordination was initiated and continued throughout the preparation of the document, presentations were made to various organizations and other special interests, and a variety of public involvement activities (public scoping workshops, field reviews, newsletters, and public hearings) were held.

Coordination with the Utah State Historic Preservation Office and the Federal Advisory Council on Historic Preservation to facilitate the required Section 106 consultation resulted in a Memorandum of Agreement for cultural resource impacts and mitigation. Coordination with the U.S. Army Corps of Engineers (Corps) relative to wetland impacts resulted in a Section 404 Permit for the Project. Informal Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) provided concurrence with a determination of no adverse effect on threatened and endangered species from

the Project. The Utah Division of Wildlife Resources (UDWR), Utah Division of Water Rights, and Utah Division of Water Quality provided additional consultation on potential impacts and mitigation measures.

The public involvement and agency coordination noted above, in conjunction with a variety of technical impact analyses of the proposed Project and the VE study, resulted in the decision to shift the alignment for the Wildwood to Deer Creek State Park Segment from the 1989 SEIS Alignment to the new Preferred Alignment. The 1995 Re-evaluation summarized that process, documented the decision, and was approved on July 14, 1995.

Following the completion of the 1995 Re-Evaluation, a lawsuit was filed challenging various aspects of the environmental reviews and compliance for the Provo Canyon Improvement Project. The lawsuit was resolved by a stipulation approved by the court in 1998. The 1998 Stipulation included, among other things, a requirement that FHWA and UDOT prepare a second SEIS before proceeding with the "next phase" of construction (i.e., Wildwood to Deer Creek State Park). As a result of that stipulation, this SEIS was initiated in February 2000.

2000 Value Engineering Study

A second Value Engineering study was initiated by UDOT in 2000 to further investigate several project components and evaluate potential design improvements. A total of seven major components of the project (dam spillway structure, power plant avalanche protection, power plant access road, reservoir avalanche protection, HVHR crossing, highway pavement, and dam buttress) were evaluated in terms of geometrics/safety, construction cost, traffic maintenance, compatibility of dam stability, environmental impact, and avalanche protection. Various design modifications of six of the components were recommended by the study, and will be evaluated further during final design.

2001 Avalanche Analysis

The preferred alternative identified in the 1989 SEIS included a snowshed over the highway in the area of a major avalanche path on the southeast corner of Deer Creek Reservoir to allow debris to pass over the roadway facility during an avalanche event. As a result of the 2000 VE study (Ventry 2000), a proposal was made to consider placing the highway on a structure to allow debris to pass under the roadway, rather than constructing the snowshed. In order to resolve this issue, UDOT contracted an updated avalanche analysis (McClung 2001) to evaluate design issues associated with two major avalanche paths.

The McClung analysis concluded that two large, mechanically stabilized earth (MSE) walls included in the 1989 SEIS preferred alignment design would not provide any additional avalanche protection for the dam power plant facilities, and those walls were eliminated from the design. The analysis also indicated the value of regrading an old access road above the power plant, which had acted as a partial avalanche barrier, back into its original configuration as an avalanche chute. This work was completed by the U.S. Department of the Interior, Bureau of Reclamation (BOR) and Provo River Water Users Association and will reduce the potential for avalanche impacts to the power plant and the new highway.

Additional research during final design will examine the possibility of using passive snow-retaining and/or active control (e.g., explosive ordinance) devices rather than either structure to reduce avalanche danger.

2001 Geotechnical Study

Slope stability and general public concerns associated with the Hoover Slide in this section suggested the value of an independent review of the geotechnical aspects of the alignment. UDOT contracted Landslide Technology, Inc. of Oregon to conduct a complete geotechnical peer review of the alignment during 2001. That analysis concluded that the alignment recommended in the 1995 Re-Evaluation – not the alignment recommended in the 1989 SEIS – is the most practicable and feasible route through this area (Landslide Technology 2001).

Ongoing Design Effort

The engineering firm of Parsons Brinkerhoff is under contract with UDOT to complete additional design of the Wildwood to Deer Creek State Park Segment of the Project. That effort started with the Preferred Alignment from the 1995 Re-evaluation, and will work to refine and finalize the design by the end of 2003. All design effort is being closely coordinated with the existing environmental documents and public involvement, with the objective of further reducing impacts where possible.

Deer Creek State Park to Heber City

The alignment and conceptual design for the remainder of the Project from Deer Creek State Park to Heber City remains as presented in the 1989 SEIS. Pertinent environmental and other data for this segment was updated as a part of this analysis and is included in Chapter 3. Likewise, potential impacts from the Project are summarized in Chapter 4. When further work on the segment is programmed and funded in the future, additional environmental documentation and detailed design will be initiated.

Alternatives Analysis in Current Supplemental Environmental Impact Statement (SEIS)

As explained above, the alternative approved in the 1989 SEIS was divided into four distinct segments for purposes of final design and construction. Since 1990, two of those four sections have been completed – Murdock Diversion to Upper Falls, and Upper Falls to Wildwood. In addition, prior to 1989, improvements had been completed from Orem to Murdock Diversion, based on the 1978 EIS.

As a result of that previous work, there now exists a completed four-lane roadway from Orem to Wildwood. There are only two segments of the original Provo Canyon Improvement Project that have not yet been completed – Wildwood to Deer Creek State Park, and Deer Creek State Park to Heber City. These two uncompleted sections are covered in this SEIS. This SEIS focuses primarily on the segment from Wildwood to Deer Creek State Park.

The alternatives analysis for the proposed highway reconstruction in this SEIS consists of the following elements:

- Wildwood to Deer Creek State Park - 1989 SEIS Preferred vs. 2002 Preferred
- Deer Creek State Park to Heber City - Update on 1989 Preferred
- Re-Evaluation of Previously Eliminated Alternatives

This scope of the alternatives analysis in this SEIS is consistent with the regulatory requirements established by the Council on Environmental Quality (CEQ) and by FHWA. These requirements are discussed further at the end of this section.

Wildwood to Deer Creek State Park – 1989 Preferred vs. 2002 Preferred Alignment

The primary focus of this SEIS is the Wildwood to Deer Creek State Park Segment, because that is the segment in which new information has been developed and changes in the project have been proposed.

Based on the 1995 VE study, the 1995 Re-Evaluation, and the technical studies completed in 2000 and 2001, as well as extensive agency coordination and public involvement, UDOT identified a preferred alignment for the Wildwood to Deer Creek State Park Segment of the Project in the September 2002 Draft SEIS. This new preferred alternative will be referred to in this document as the "2002 Preferred Alignment" to distinguish it from the preferred alignment identified in the 1989 SEIS, which will be referred to as the "1989 SEIS Alignment."

The 2002 Preferred Alignment for the Wildwood to Deer Creek State Park Segment generally represents the least environmentally damaging and safest alternative available. In comparison to the 1989 SEIS Alignment, the new preferred alternative has numerous advantages, including the following:

- Movement of the highway away from the Provo River (reduced water quality, fisheries, and habitat impacts);
- Increased geotechnical stability; elimination of river bridges; reduced human impacts (noise, traffic delays, and relocations); and
- Reduced cultural resource impacts; and improved constructability (less cost).

The 2002 Preferred Alignment also involves some impacts that would have been avoided by the 1989 SEIS Alignment. These additional impacts include the following:

- Impacts to the Canyon Meadows development; and

- Impacts to the Deer Creek Reservoir Dam Complex, which is a historic property eligible for the National Register of Historic Places.

The 2002 Preferred Alignment was presented to the public at formal Public Hearings (Chapter 6), and via continued public outreach with newsletters, the Project website, and recent public meetings.

Deer Creek State Park to Heber City - Update of 1989 Preferred Alignment

The Deer Creek State Park to Heber City Segment of the Project remains at the same conceptual level of detail presented in the 1989 SEIS. This segment is not programmed for construction, and no design work has been completed since the 1989 SEIS. However, for disclosure purposes, this SEIS provides updated environmental information for this section. This additional information is provided in Chapter 4. In addition, the Purpose and Need for Action chapter of this document (Chapter 1) provides traffic data for the Project area as a whole, including the portion of the corridor between Deer Creek State Park and Heber City.

The updated traffic and environmental information for this section have not revealed any changed circumstances or new information that would require consideration of alignment shifts or the evaluation of impacts not considered in the 1989 SEIS. In the future, when more detailed engineering is performed for this segment, a Re-Evaluation or an SEIS will be prepared. In any event, additional environmental analysis, including additional agency coordination and opportunities for public involvement, will occur in the future before any decision is made to proceed with construction from Deer Creek State Park to Heber City.

Re-Assessment of Previously Eliminated Alternatives

As explained above, this SEIS focuses on new information that has been developed and changes to the Project that have occurred since the 1989 SEIS. As a result, it is not necessary in this SEIS to undertake a completely new analysis of the full range of alternatives considered in the 1989 SEIS. However, in response to comments received on the September 2002 Draft SEIS, this Final SEIS includes a re-assessment of the No Build Alternative and potential Three-Lane Alternatives, which were eliminated in previous studies for failing to meet the Project's purpose and need.

No Build Alternative

As detailed in Chapter 1, this analysis was purposely limited in scope and not intended to evaluate new, proposed alternatives or to revisit the analyses of previous alternatives. Rather, consistent with National Environmental Policy Act and the Council on Environmental Quality Regulations, it was directed at taking the requisite "hard look" for new impacts and supplementing the record with any changes or new circumstances bearing on the proposed action and its impacts.

As disclosed in Chapters 1 and 4, considerable time has passed and a variety of changes and additional development have taken place in the general area. Recent and future growth and development are discussed in detail under Land Use in Chapter 4. As noted above, the No Action or No-Build Alternative was rejected in the 1989 SEIS and again evaluated during this effort, and no significant changes from previous analyses were identified. The results of the Value Engineering Study that was used to develop the Preferred Alternative in 1995 were also reviewed in detail (see Chapter 2 and Appendix D), with similar results. As noted in Chapter 1, a new traffic study indicated that traffic volumes in the Project corridor have increased considerably and that the additional capacity to be provided is even more needed than in 1989. The geometric and other safety concerns are still present and, as comment on the draft document indicated, highly desirable to most of the traveling public.

Three-Lane Alternative

In the 1989 SEIS, the FHWA and UDOT determined that four lanes of capacity (two in each direction) are required in order to meet the safety and capacity needs in the corridor. As a result, three-lane alternatives were briefly considered and eliminated in the Alternatives chapter of that document.

During the preparation of this SEIS, the FHWA and UDOT conducted additional traffic studies to determine whether the safety and capacity needs in the corridor had changed. The results of this analysis are presented in Chapter 1 – Purpose and Need. As explained in that chapter, the results of that analysis confirm that there is an even greater need today than in 1989 for a four-lane highway in this corridor. Based on the information presented in Chapter 1, the FHWA and UDOT have re-confirmed their previous conclusion that three-lane alternatives, regardless of configuration, would not satisfy the purpose and need for this project.

Four-Lane Alternatives

Every traffic study conducted during and since the 1989 SEIS has concurred that only a four-lane highway configuration will provide the Level of Service and adequate safety to meet the purpose and need of the project. As noted in Chapter 1, these concerns continue to exist, and tend to worsen as traffic volumes increase. The improvements in traffic movement and safety on completed segments of the overall project are also expected to occur on the remaining segments with the proposed four-lane configuration.

Consistency with Regulatory Requirements

The Council on Environmental Quality (CEQ) regulations, which apply to all Federal agencies, address the circumstances in which an SEIS is required. The CEQ regulations state that an SEIS must be prepared if (1) the agency "makes substantial changes in the proposed action that are relevant to environmental concerns" or (2) "[t]here are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts" (40 C.F.R. 1502.9(c)(1)). The CEQ regulations also recognize that an SEIS may be prepared, at an agency's discretion, if preparation of an SEIS would further the purposes of National Environmental Policy

Act (40 C.F.R. 1502.9(c)(2)). In this case, the preparation of an SEIS is appropriate for a variety of reasons, including in particular changes in the alignment of the preferred alternative between Wildwood and Deer Creek State Park since issuance of the 1989 SEIS.

The FHWA regulations specifically provide for preparation of an SEIS of "limited scope." (23 C.F.R. 771.130)(f)) The FHWA regulations state that:

> (f) In some cases, a supplemental EIS may be required to address issues of limited scope, such as the extent of proposed mitigation or the evaluation of location or design variations for a limited portion of the overall project. Where this is the case, the preparation of a supplemental EIS shall not necessarily:
> (I) Prevent the granting of new approvals;
> (ii) Require the withdrawal of previous approvals; or
> (iii) Require the suspension of project activities; for any activity not directly affected by the supplement. If the changes in question are of such magnitude to require a reassessment of the entire action, or more than a limited portion of the overall action, the Administration shall suspend any activities which would have an adverse environmental impact or limit the choice of reasonable alternatives, until the supplemental EIS is completed.

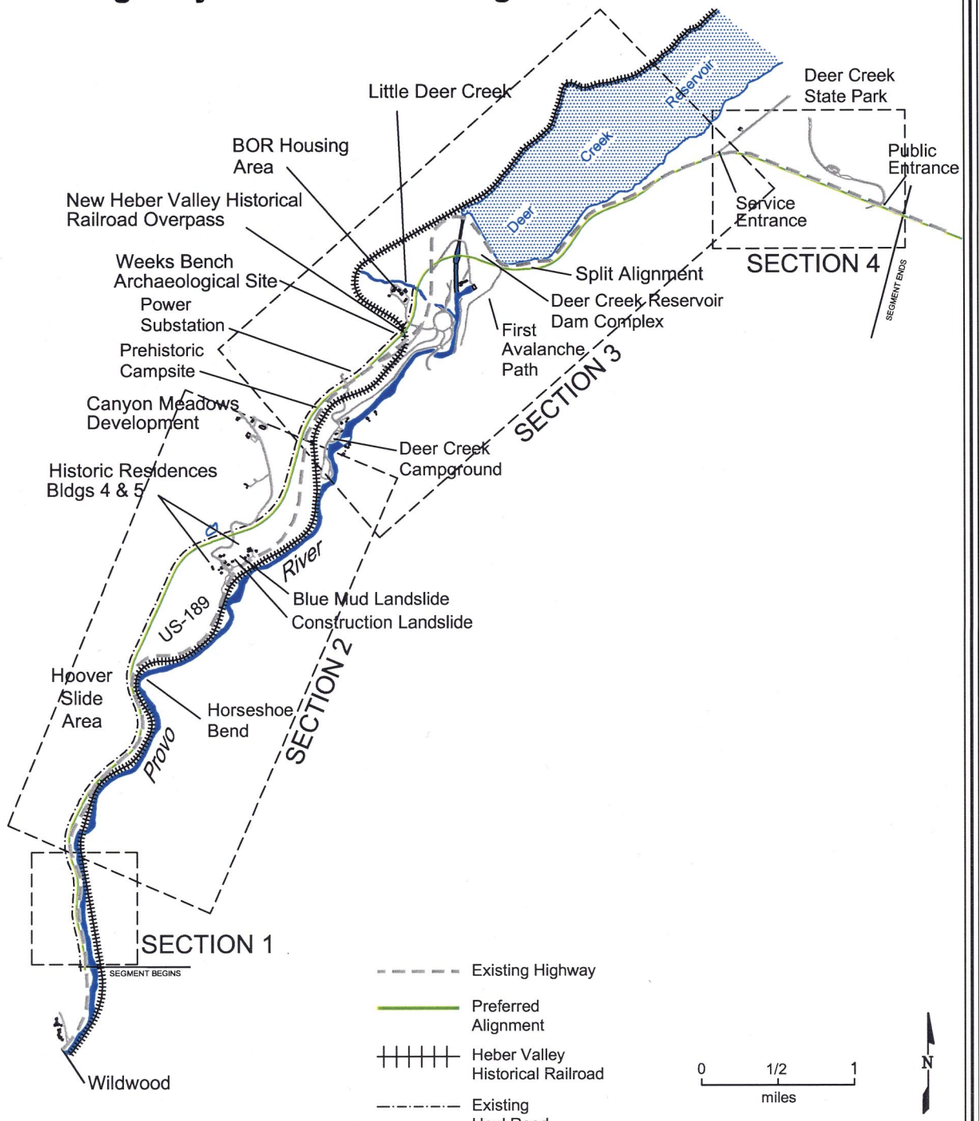
Consistent with this section of the FHWA regulations, this SEIS addresses issues of limited scope, rather than re-examining all of the issues considered in the 1978 EIS and 1989 SEIS. In particular, this SEIS focuses on a comparison of the 1989 Preferred Alignment and the 2002 Preferred Alignment for the Project between Wildwood and Deer Creek State Park. However, as explained above, this SEIS also provides updated information on the other uncompleted segment of the Project, from Deer Creek State Park to Heber City, and also re-evaluates major alternatives eliminated in the 1989 SEIS. In this way, the scope of the SEIS includes the entire Project examined in the 1989 SEIS, while recognizing that substantial portions of that Project have already been completed.

Description of 2002 Preferred Alignment - Wildwood to Deer Creek State Park

The 2002 Preferred Alignment analyzed in the re-evaluation and in this document is presented in schematic form in Figures 2-1, 2-2, and 2-3 as a comparison with the 1989 SEIS Alignment. Detailed plans of both alignments are provided in Appendix E. The 2002 Preferred Alignment plans represents the preliminary design (30 percent complete) developed for the VE analysis, including roadway stationing. The design effort currently underway will further refine that design to reduce impacts and improve constructability.

In accordance with the results of the median barrier and wall treatment re-evaluation (FHWA 2001) discussed under Upper Falls to Wildwood above, concrete median barrier would be placed in certain hazardous driving locations within the Wildwood to Deer Creek State Park Segment for safety

U.S. Highway 189 - Preferred Alignment



U.S. Highway 189 - SEIS Alignment

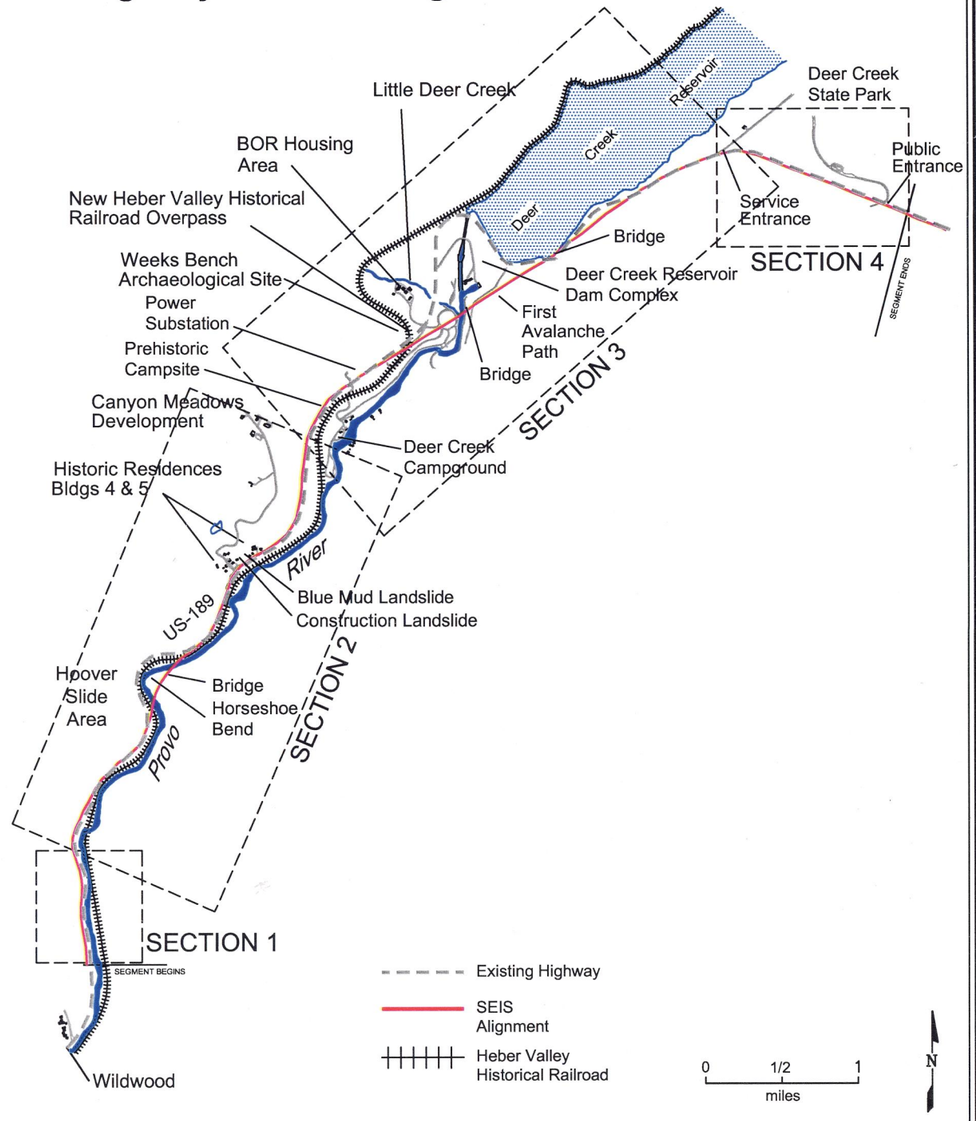


Figure 2-1. The 1989 SEIS and 2002 Preferred Alignments for the Wildwood to Deer Creek State Park Segment, Provo Canyon Highway Improvement Project.

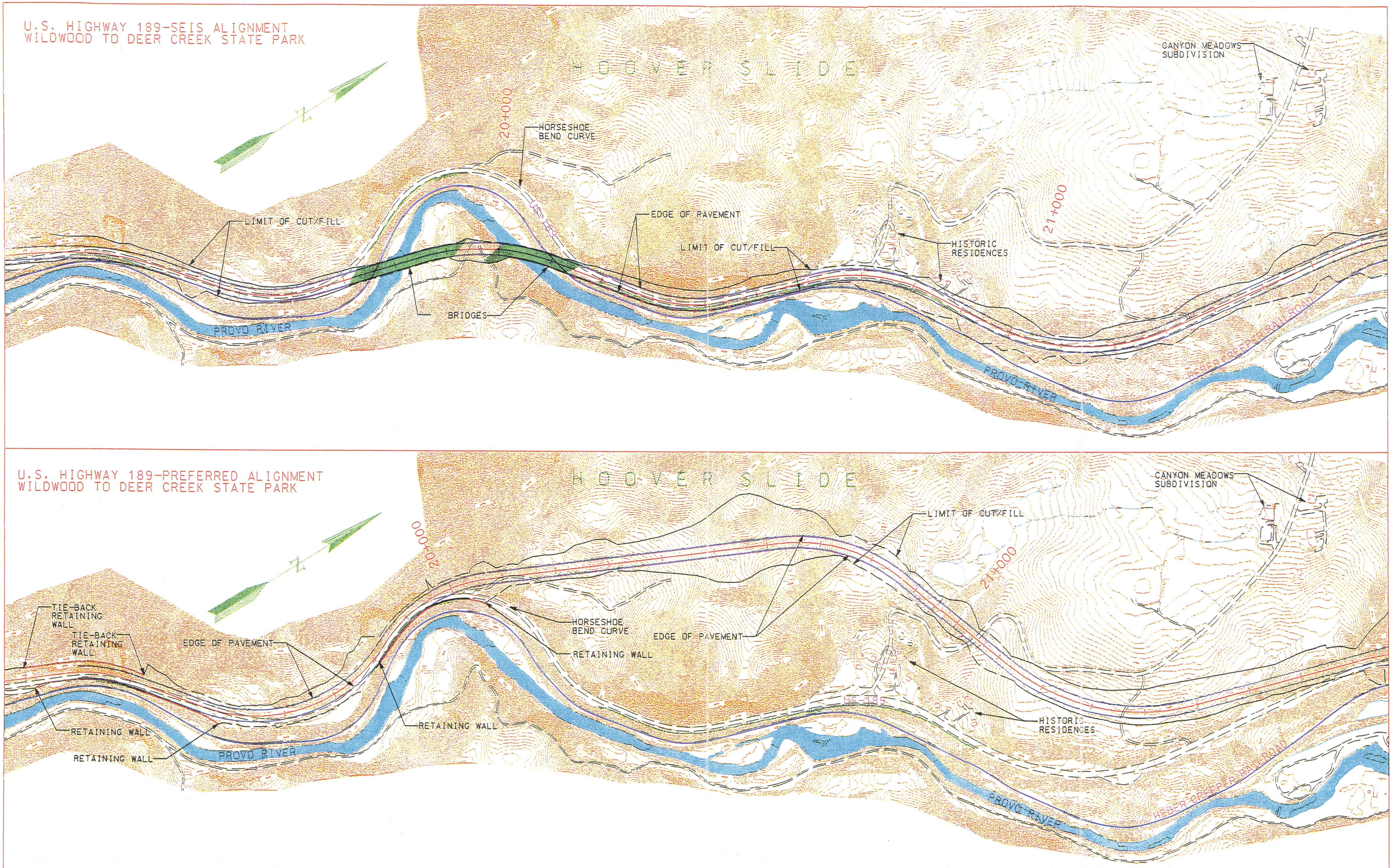


Figure 2-2. Section 2 of Wildwood to Deer Creek State Park Segment, Provo Canyon Highway Improvement Project.

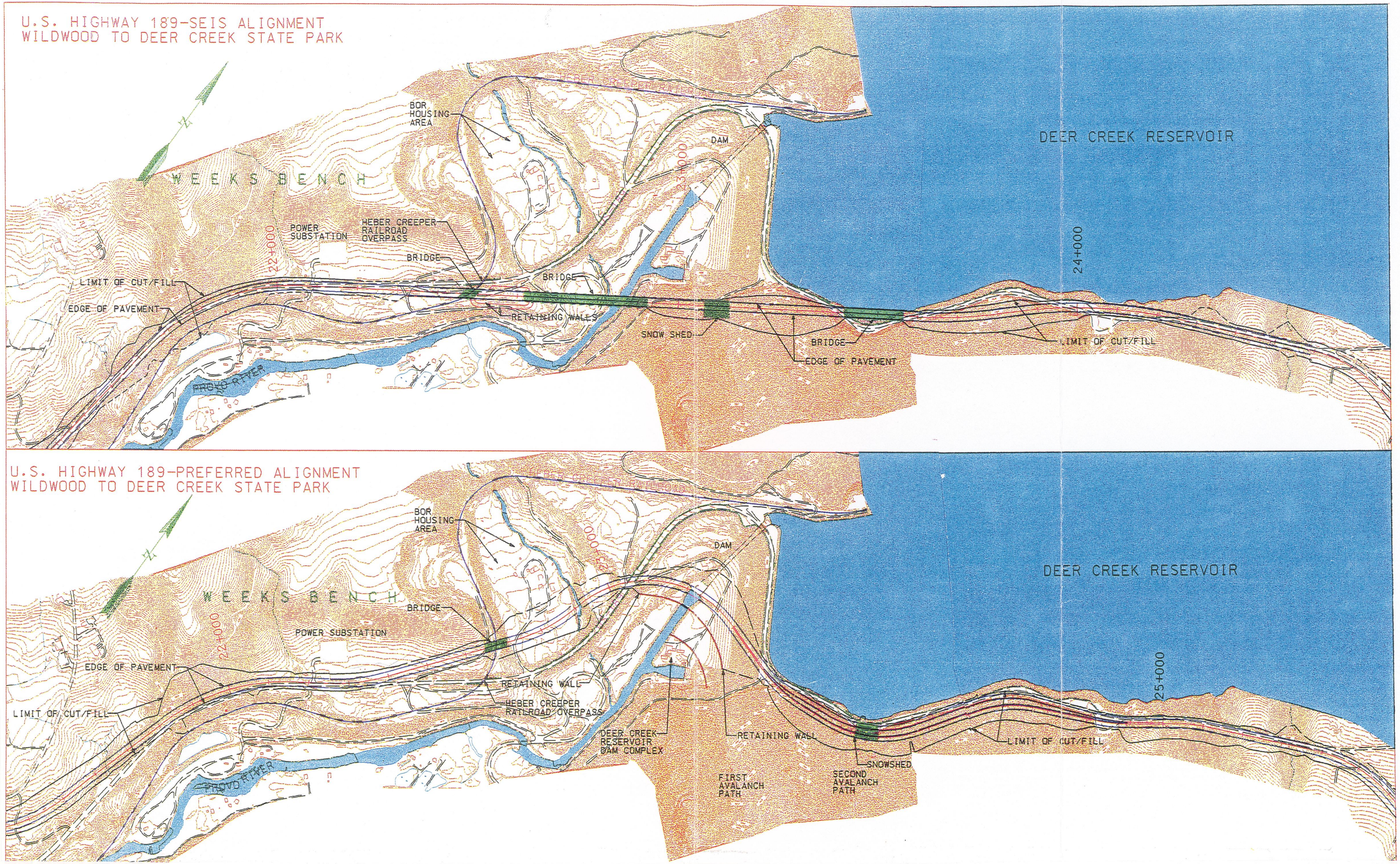


Figure 2-3. Section 3 of Wildwood to Deer Creek State Park Segment, Provo Canyon Highway Improvement Project.

purposes, and wall treatments would be consistent with those in the Upper Falls to Wildwood Segment.

The 2002 Preferred Alignment is described below by section, with approximate roadway stationing from the Appendix E plans.

Section 1: Wildwood to Horseshoe Bend (Roadway Station 18+200 to Roadway Station 19+200)

The horizontal alignment and vertical profile were adjusted slightly from the 1989 SEIS Alignment to form the Preferred Alignment for Section 1. The alignment eliminated retaining walls and roadway fill slopes that would encroach on the Provo River or the HVHR with the 1989 SEIS Alignment. As a consequence, the 2002 Preferred Alignment increased cut slope distances along the west side of the roadway. The four-lane finished roadway of the alignment would have guardrail on the up-canyon traffic side of the roadway, and clear zones on the down-canyon traffic side with a drainage ditch that would also act as a rock fall zone. The "construction" landslide immediately above the Wildwood turnoff would be removed and remediated as a part of the Project in this section, as would the "blue mud" landslide slightly up the canyon. On-going design efforts suggest that constructing a split alignment through much of this section would provide improved geotechnical stability, reduced disturbance, and move further from the river. This adjustment will be further developed and evaluated during final design.

Section 2: Horseshoe Bend to Heber Valley Historic Railroad (HVHR) (Roadway Station 19+200 to Roadway Station 21+700)

The 2002 Preferred Alignment departs horizontally and vertically from the existing highway at Station 20+000 and rises to the saddle north of the Horseshoe Bend curve on the existing haul road, while the 1989 SEIS Alignment would remain on the existing roadway alignment (Figure 2-2). The alignment then crosses below the Canyon Meadows subdivision and rejoins the existing highway near the HVHR Overpass.

Unique geology and limited horizontal width in the Horseshoe Bend area will likely require the use of retaining walls to maintain slope stability and minimize cut and fill slopes. As noted previously, the features of the preliminary design are evaluated in this document, but an ongoing design effort may include refinements that further reduce impacts and improve constructability. East of Horseshoe Bend, adequate horizontal width exists to achieve clear zone distances during cut or fill conditions. The roadway cross-section makes use of a 3-meter (10-foot) cut ditch that also acts as a rock fall zone. To serve the residents of Canyon Meadows, an at-grade intersection with standard acceleration and deceleration lanes will be constructed approximately where the alignment traverses the existing entrance road, and the existing roadway will be reconstructed as needed to provide a gated secondary access. Access to several homes adjacent to the existing highway near the current Canyon Meadows entrance will be maintained via the existing highway, as will fisherman and other recreational access. Any portions of the existing highway not retained for access as noted above will be recontoured and revegetated to their original condition with appropriate erosion control and landscaping.

Section 3: Heber Valley Historic Railroad (HVHR) to First Deer Creek State Park Entrance (Roadway Station 21+700 to Roadway Station 25+400)

The 2002 Preferred Alignment departs from the existing highway near the power substation at Station 22+200 and rises to pass over the HVHR near its existing overpass. The alignment will pass over an existing fill placed during construction of the previous highway segment and then traverse across the face of Deer Creek Dam with the vertical profile rising so that the entire section is built upon roadway fill and a structure across the spillway which will also buttress the dam (Figure 2-3). The alignment avoids the long bridge structure associated with the 1989 SEIS Alignment and the associated concerns of the first avalanche path near the dam.

East of the dam, the 2002 Preferred Alignment was originally planned to split into two separate roadways with the down-canyon lanes closely matching the elevation of the existing highway, and continuing until merging again into one roadway at the first entrance to Deer Creek State Park. Further analysis during ongoing design has eliminated the need for this split, as the result of including soldier pile walls to support the roadway at some locations immediately adjacent to the reservoir.

Section 4: First Deer Creek State Park Entrance to End of Segment (Roadway Station 25+400 to Roadway Station 26+700)

The horizontal and vertical profiles of the 2002 Preferred Alignment in this segment will be the same as the 1989 SEIS Alignment and are horizontally and vertically approximately the same as the existing highway.

Several sections of the current highway would be abandoned upon construction of the Preferred Alignment. Portions of these sections would be left in place to provide private property and recreational access. Any sections not used for access would be recontoured and revegetated to improve aesthetic and erosion control functions. Federal property formerly used for the existing highway (i.e., the roadway on top of the dam) would be released back to BOR.

Efforts to protect the Provo River and its hydrological and ecological functions both during and after construction will be a significant component of the Preferred Alternative. These efforts will be comprised of an extensive list of Best Management Practices (BMPs). The BMP implementation measures and supporting data are presented in detail in Chapter 4 under the Water Resources section.

Unique geology and limited horizontal width in the Horseshoe Bend area will likely require the use of retaining walls to maintain slope stability and minimize cut and fill slopes. As noted previously, the features of the preliminary design are evaluated in this document, but an ongoing design effort may include refinements that further reduce impacts and improve constructability. East of Horseshoe Bend, adequate horizontal width exists to achieve clear zone distances during cut or fill conditions. The roadway cross-section makes use of a 3-meter (10-foot) cut ditch that also acts as a rock fall zone. To serve the residents of Canyon Meadows, an at-grade intersection with standard acceleration and deceleration lanes will be constructed approximately where the alignment traverses

the existing entrance road, and the existing roadway will be reconstructed as needed to provide a gated secondary access. Access to several homes adjacent to the existing highway near the current Canyon Meadows entrance will be maintained via the existing highway, as will fisherman and other recreational access. Any portions of the existing highway not retained for access as noted above will be recontoured and revegetated to their original condition with appropriate erosion control and landscaping.

Section 3: Heber Valley Historic Railroad (HVHR) to First State Park Entrance (Roadway Station 21+700 to Roadway Station 25+400)

The 2002 Preferred Alignment departs from the existing highway near the power substation at Station 22+200 and rises to pass over the HVHR near its existing overpass. The alignment will pass over an existing fill placed during construction of the previous highway segment and then traverse across the face of Deer Creek Dam with the vertical profile rising so that the entire section is built upon roadway fill and a structure across the spillway which will also buttress the dam (Figure 2-3). The alignment avoids the long bridge structure associated with the 1989 SEIS Alignment and the associated concerns of the first avalanche path near the dam.

East of the dam, the 2002 Preferred Alignment was originally planned to split into two separate roadways with the down-canyon lanes closely matching the elevation of the existing highway, and continuing until merging again into one roadway at the first entrance to Deer Creek State Park. Further analysis during ongoing design has eliminated the need for this split, as the result of including soldier pile walls to support the roadway at some locations immediately adjacent to the reservoir.

Section 4: First State Park Entrance to End of Project (Roadway Station 25+400 to Roadway Station 26+700)

The horizontal and vertical profiles of the Preferred Alignment in this section will be the same as the SEIS Alignment and are horizontally and vertically approximately the same as the existing highway.

Several sections of the current highway would be abandoned upon construction of the Preferred Alignment. Portions of these sections would be left in place to provide private property and recreational access. Any sections not used for access would be recontoured and revegetated to improve aesthetic and erosion control functions. Federal property formerly used for the existing highway (i.e., the roadway on top of the dam) would be released back to BOR.

Efforts to protect the Provo River and its hydrological and ecological functions both during and after construction will be a significant component of the Preferred Alternative. These efforts will be comprised of an extensive list of best management practices (BMPs). The BMP implementation measures and supporting data are presented in detail in Chapter 4 under the Water Resources section.

TRAIL EXTENSION

Background

Previous environmental documents for US-189 improvements have acknowledged the proposed Provo-Jordan River Parkway Trail (Trail) and committed, at a minimum, that highway design and construction would not preclude the future construction of the Trail. As noted in Chapter 1, the Vivian Park to Deer Creek Trail Extension (Trail Extension) would be a continuation of the regional Trail currently linking the Great Salt Lake to Utah Lake State Park and continuing through Provo and Orem, and into Provo Canyon to Vivian Park. The Trail from near Bridal Veil Falls to Vivian Park was constructed on an abandoned portion of the HVHR as a part of the Upper Falls to Wildwood Segment of the highway Project.

The Trail Extension would be designed with a functional classification of Bike Trail and have a 48-kilometer- (30-mile-) per-hour design speed and a preferred width of 3 meters (10 feet), with a 2.4-meter (8.0-foot) minimum width. Where possible, a 0.6-meter (2.0-foot) graded shoulder and 0.9-meter (3.0-foot) clear zone would be provided to the extent possible. Maximum grade would be 5 percent with the exception of areas where the trail must traverse natural terrain, where the grade cannot be reduced. The Trail Extension would have a minimum horizontal separation of 1.5 meters (5.0 feet) from the highway shoulder (without barrier) and 3 meters (10 feet) from the railroad.

It is anticipated that the Trail will eventually include an additional extension between Deer Creek Dam and Soldier Hollow State Park in the vicinity of Charleston on the north end of Deer Creek Reservoir. Possible alignments and impacts for this portion of the Trail are not included in this document. Wasatch County and the Utah Department of Natural Resources (UDNR), Division of Parks and Recreation (State Parks) have agreed to be responsible for the operation and maintenance of the Trail Extension from Vivian Park to Deer Creek Dam and are developing an agreement in that regard.

Alternative Development

Recognizing the importance of completing the Trail through the canyon, in 1994 State Parks commissioned a trail feasibility study for the area from Charleston Siding on the north end of Deer Creek Reservoir to Vivian Park. This study (Bear West 1994) identified four potential alignments through the corridor from Charleston Siding to Vivian Park.

Three of these alignments were carried forward as the basis for the current analysis. The fourth alignment evaluated in the feasibility study proposed utilizing the HVHR alignment and would only be feasible in the event that the railroad permanently ceased operations in this area. As such, it was not considered further. Recent field visits and additional analyses identified a variety of other alignments and variations, but further evaluations have narrowed the feasible alignment corridors to three: A, B, and C (see Preferred Alignment Maps, Appendix E). Each of the alignment corridors

connect the termini of the existing Trail at Vivian Park to a trailhead to be located in the vicinity of Deer Creek Dam. The termini cannot be located on the dam for safety and security reasons.

In accordance with National Environmental Policy Act and Council on Environmental Quality requirements, an environmental analysis must include a "No Action" Alternative. In this case, that alternative would preclude the construction of the Trail Extension from Vivian Park, and no recreational trail facilities beyond that would be constructed.

For purposes of developing and describing potential alignment alternatives, the Trail Extension Project Area was divided into six segments (Appendix E), each delineated by an existing or potential river crossing to facilitate the combination of alignment options from various segments.

Segment 1 - Vivian Park to Wildwood

This segment extends from Vivian Park to the Wildwood turn-off, where a river crossing could be constructed.

- Alignment A - This alignment would remain on the south side of the HVHR, paralleling the rail at a 6.1-meter (20.0-foot) offset (railroad centerline to Trail centerline) and following the same grade as the rail. A cut into the hillside and a 4-meter- (13-foot-) high retaining wall would be constructed for most of the first 1.9 kilometers (1.2 miles).

- Alignment B - Alignment B would cross the railroad at the existing roadway crossing at Vivian Park and continue on the north side of the railroad at a 6.1-meter (20.0-foot) offset for 1.9 kilometers (1.2 miles), closely following the edge of the Provo River and sometimes encroaching into the river.

- Alignment C - Alignment C would cross the railroad tracks at the existing access to Vivian Park and cross over the Provo River bridge, which was replaced in 2002. The Trail Extension would then follow existing US-189 between the river and the highway. Several constricted areas where retaining walls separate the highway from the river would require the Trail Extension to traverse along the base of the walls in conjunction with existing fisherman access paths near the river's edge or to be built on an elevated bridge that would hang off the wall at roadway elevation or lower.

Segment 2 - Wildwood to Ault's Bridge

This segment extends from the Wildwood turn-off to Ault's Bridge, where a river crossing exists.

- Alignment A - Alignment A would move away from the HVHR to skirt around several small ponds and then follow the Salt Lake Aqueduct across a large wetland area to a Salt Lake Aqueduct concrete structure. Any portion of the trail that is proposed to cross or parallel the existing right-of-way for the Salt Lake Aqueduct must be approved (through a permitting process) by BOR. The BOR has concerns with the type of material that may be used to construct the trail. The BOR would also have concerns with the weight limit imposed on any

traffic that may cross the aqueduct during construction and after completion of the trail. The water organizations that maintain the aqueduct must be allowed access to the aqueduct without interference from the Trail Extension. The Trail Extension cannot interfere with the purposes of the Salt Lake Aqueduct. The Trail Extension would traverse around a steep rocky point and cross back over the tracks to follow an existing road for a short distance to the existing Ault's Bridge. Other options for crossing the tracks would be to cut the rocky point to provide room for the Trail Extension or to construct the Trail Extension over the rocky point, which would require extensive grades and curves.

- Alignment B - Alignment B continues parallel to the HVHR for 0.9 kilometer (0.6 mile) then follows the Salt Lake Aqueduct across the HVHR and joins with Alignment A.

- Alignment C - This alignment would continue immediately adjacent to US-189.

Segment 3 - Ault's Bridge to Horseshoe Bend

This segment extends from Ault's Bridge to the Horseshoe Bend area, where a river crossing could be constructed.

- Alignments A and B - These alignments would follow an existing private gravel road for 1.1 kilometers (0.7 mile) along the east side of the Provo River.

- Alignment C - Alignment C would parallel the railroad on the north for the next 1.1 kilometers (0.7 mile) at the same grade. This section of the Trail Extension would require an approximately 4-meter- (13-foot-) high retaining wall between the railroad and the existing highway. Alignment of the Trail Extension on the south side of the tracks between the railroad and the river was investigated in this area, but excessive encroachment into the river precluded further consideration.

Segment 4 - Horseshoe Bend to Deer Creek Campground

This segment extends from Horseshoe Bend to just downstream of the existing Deer Creek Campground on the Provo River, where a river crossing could be constructed.

- Alignments A and B - These alignments would continue to follow the existing private gravel road for 1.7 kilometers (1.1 miles). The alignments would traverse up a 14-percent grade for 100 meters (328 feet) and down a 14-percent grade for 120 meters (394 feet), but the remainder of the Trail Extension would have a grade of less than 4 percent.

- Alignment C - At Horseshoe Bend Alignment C would climb onto the existing highway where it will be abandoned when the proposed new highway is constructed. The alignment would then follow the existing highway for 1.7 kilometers (1.1 miles).

Segment 5 - Deer Creek Campground to Heber Valley Historic Railroad (HVHR) Crossing

This segment extends from Deer Creek Campground to where the proposed new roadway would cross over the HVHR near Weeks Bench. A river crossing exists in this segment.

- Alignment A - Alignment A would continue to follow the existing dirt road until crossing the Provo River on an existing bridge. After crossing the river, the Trail Extension would follow an existing road up to the present highway and follow the new dam access road to the new HVHR overpass.

- Alignment B - At the beginning of Segment 5, Alignment B would deviate from Alignment A by crossing the Provo River on a new bridge where the Salt Lake Aqueduct crosses immediately downstream from the campground. The Trail Extension would continue along the aqueduct behind the campground, cross the campground access road, follow an existing gravel road for 300 meters (984 feet), and then traverse a side hill to join Alignment C at the existing HVHR overpass.

- Alignment C - The Trail Extension would cross to the south side of the HVHR above the campground and traverse adjacent to it, across several small cuts and fills to the existing HVHR overpass.

Segment 6 - HVHR Crossing to Deer Creek Dam

This segment extends from the HVHR crossing to the Deer Creek Dam vicinity.

- Alignments A, B, and C - All three alignments would merge to pass under the proposed new highway via an underpass and join the proposed dam access road to an area near Deer Creek Dam.

The various alignments through each of the segments were carried through preliminary design to facilitate additional analysis. Alignment options could be combined from one segment to another, utilizing the existing or potential river crossings at the various segment breaks, or with the No Action Alternative in one or more segments. For instance, Alignment C in Segment 1 could cross over a bridge constructed at Wildwood and continue as Alignment A for the remainder of the Trail Extension. All railroad crossings would be constructed at-grade. River crossings would be pedestrian/bike clear span crossings only, unless they were combined with existing crossings.

During the alternative development process, extensive agency, public, and special interest coordination was conducted. Details in this regard are provided in Chapter 6. Input from the various agencies and the public expressed strong support for the Trail but indicated considerable concern with Trail Extension alignments that would generate significant environmental impacts. The Vivian Park to Wildwood and Wildwood to Ault's Bridge segments were of the greatest concern, since the highway and the railroad are immediately adjacent to each side of the river and are bounded by steep, unstable canyon walls.

Alignment A through Segments 1 and 2 would necessitate extensive hillside cuts and retaining walls at considerable expense, result in the loss of riparian and upland vegetation and trees, significantly increase erosion/sedimentation potential near the river, potentially impede operation and maintenance of the railroad, and produce a variety of railroad safety-related issues. As a result, this alignment was eliminated from further consideration; however, as future demand generates additional funding, this alignment may become viable and, if so, the environmental impacts would need to be better quantified and mitigated at that time. Alignment B would require placing fill into the river and extensive impacts to wetlands adjacent to the river, as well as impact railroad operations and maintenance and result in similar safety concerns. As a result, this alignment was eliminated from further consideration.

Although its location immediately adjacent to the highway was less desirable from an aesthetic and safety aspect, the option of constructing Alignment C through Segments 1 and 2 was evaluated further. Since over one-half (approximately 59 percent) of the linear distance of the highway through Segments 1 and 2 contain MSE retaining walls without sufficient shoulder width for a trail behind the guardrail, the Trail Extension would be located along the base of the walls where a gravel fisherman's access path has been constructed.

Following further coordination and site visits, the Corps, in conjunction with the USFWS Service and the Utah Department of Natural Resources, UDWR, determined that Special Condition 1 of Permit No. 199250261 issued by the Corps for the Upper Falls to Wildwood Segment of the Provo Canyon Highway Improvement Project required the long-term maintenance of an 8-foot buffer beyond the ordinary high water mark of the Provo River and that no additional disturbance would be allowed within that buffer (Corps 2002). For over one-half (57 percent) of the length of the MSE-walled segments (1 and 2), the corridor is too narrow to facilitate the standard trail width without disturbing the buffer, necessitating narrowing the Trail Extension to 1.0 to 1.5 meters (3.0 to 5.0 feet). In some areas there is no space at all beyond the buffer for the Trail Extension, requiring costly construction of an elevated bridge or boardwalk that would hang off the wall at roadway elevation or lower. This construction would still potentially impact the riparian corridor, utilization by various bird and other species, and current fisherman use (Hintze 2002).

As a result, the Corps determined that constructing Alignment C through Segments 1 and 2 would be incompatible with the conditions of the permit and recommended an alternative that terminated the Trail Extension at Vivian Park (as is the current situation) and began again near Ault's Bridge (Carter 2002).

Since the corridor widens and opens up beyond Ault's Bridge, any of the three alignments could be implemented in Segments 3 through 6. However, Alignment C and portions of Alignment B would require new construction, slope cuts, further disturbance to existing vegetation and habitat, and close proximity to the railroad with attendant safety and operational concerns. Alignment A through Segments 3 through 6 would be located entirely on an existing private gravel road and result in no environmental impacts.

Trail Extension Preferred Alternative

As a result of the above considerations and constraints, the Trail Extension Preferred Alternative is comprised of the No Action Alternative in Segments 1 and 2 from Vivian Park to Ault's Bridge, and Alignment A from Ault's Bridge to near Deer Creek Dam, as described above.

The components and implications of this alternative would include the following:

- Recreationists would continue to utilize the existing highway shoulder and trails between Vivian Park and Ault's Bridge.

- A trailhead and access from the highway immediately north of Ault's Bridge would be constructed.

- Ault's Bridge would be upgraded for the Trail Extension and local property owner use. The existing gravel road from Ault's Bridge to the existing bridge in Segment 5 (Alignment A) would be paved with no other significant improvements. Security restrictions to preclude motor vehicles, other than local property owners and emergency vehicles, from the Trail Extension would be implemented.

- One or more trailheads would be developed in conjunction with the planned restoration of the lower portion of Little Deer Creek or at the parking facility developed by BOR and the Provo River Water Users Association near Deer Creek Dam, or both.

- The development of restroom facilities at the trailhead(s) would be encouraged. A search for funding in this regard is currently underway.

This alternative will be evaluated in terms of environmental and other impacts in Chapter 4, where mitigative measures in that regard are proposed. It should be noted that a variety of "spur" trails could be developed in the future and linked to the Trail Extension Preferred Alternative with minimal impacts. The portion of the existing highway that will be abandoned between Horseshoe Bend and Weeks Bench will be maintained for recreational, fishing, and some homeowner access; and will also include a recreational trail facility in the design plans for the segment.

Alternatives Considered but Not Advanced

As noted above, the majority of alternative alignments developed and considered were eliminated on the basis of environmental impacts, safety considerations, and permitting constraints. These include Alignments A, B, and C in Segments 1 and 2; Alignments B and C in Segments 3 through 6; and a variety of other alignment variations that resulted in unacceptable wetland and riparian impacts, extensive hillside cuts, and/or additional river crossings.